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Abstract

Recently, a new theory emerged in the field of Second Generation Knowledge Management. This theory is labeled 'New Knowledge Management' and was introduced by McElroy (2003). The theory is new to the extent that it brings together several known concepts concerning knowledge management in a unique combination. In its essence, the theory consists of fourteen policies that organizations should apply to improve performance. More precisely, the theory claims that application of the fourteen policies leads to corporate sustainability and sustainable innovation. However, this claim has not been empirically validated yet. In this paper, we present a research model for validating this claim. The empirical validation of the claim has been conducted using survey data collected from 30 organizations. Results from statistical analysis indicates that application of New Knowledge Management indeed is present in more sustainable organizations, but not in innovative organizations, as proposed by its claim. In addition, it was found that corporate sustainability also heavily depends on the external orientation of organizations. This implies that the application of NKM theory is an important but not the only critical condition for organizations to obtain a sustainable position.

Keywords: Knowledge Management, New Knowledge Management, Corporate Sustainability, Sustainable Innovation.

1 INTRODUCTION

The importance of knowledge as an organizational asset in the knowledge driven economy of recent years is no longer a new topic of discussion (Alavi & Leidner, 2001). Also, the important role of Knowledge Management as the discipline that intends to structure knowledge processes is not a new concept (Hansen, Nohria & Thierney, 1999). The value of knowledge and knowledge management in order to stay on top of the innovation process and to outlearn competition may explain the existence of the continuum in which new thoughts and ideas regarding knowledge management emerge, dominate and disappear. Looking back, one could say that there has been a paradigm shift from first generation to second generation knowledge management. During the first generation, knowledge management was focused on capturing existing knowledge (from experts) and distributing it to those who need at the right time and at the right place. This approach is reflected by the knowledge management lifecycles as defined by Meyer and Zack (1996) and Liebowitz (2001). These approaches typically assume that valuable knowledge is already present inside the organization.

The second generation focuses on the human aspects of knowledge management and underlines the important role of knowledge creation that is neglected in first generation knowledge management. Through the knowledge creating role of the individual in an organization, knowledge is gained and developed. One of the best known theories in second generation knowledge management is perhaps Nonaka's Dynamic Theory of Organizational Knowledge Creation (Nonaka, 1994). Another, more recent theory is referred to as 'New Knowledge Management' (NKM) and was proposed by McElroy (2003). As with previous theories, the goal of this theory is also to apply knowledge management to develop and use the intellectual asset in the organization and to improve organizational performance. In this context, organizational performance is defined as 'corporate sustainability' and 'sustainable innovation'. It is based on a bottom-up view with respect to knowledge management in which humans are able "to self-organize around the production, diffusion and use of new knowledge" (McElroy, 2005). In other words, he claims that knowledge management can not be effectively managed top-down as proposed by the other theories. This self-organization will result in a process that is capable of continuous or sustainable innovation. To achieve this state of business, McElroy defines a number of policies. He claims that organizations that apply these policies can achieve corporate sustainability and sustainable innovation. This may be regarded as a very promising and interesting claim. However, no proof yet exists that provides a foundation for this claim. This paper intends to determine the extent to which this claim is justifiable.

The structure of the remainder of this paper is as follows: In section 2, the cornerstones of the NKM theory are presented. Section 3 presents our research model for testing the theory's claim. The results of our empirical validation are presented in section 4 and provide an insight in the extent to which the claim is justifiable. Finally, in section 5 we present our conclusions and our general thoughts and ideas about NKM are elaborated.

2 CORNERSTONES OF NEW KNOWLEDGE MANAGEMENT

This section discusses the four cornerstones of McElroy's NKM theory. The cornerstones are not completely new and we will demonstrate this by referring to related work where appropriate. After discussing the cornerstones, we present the fourteen policies that have been derived from these cornerstones. The policies are indicators for the level of NKM application by an organization.

2.1 Knowledge Lifecycle

The Knowledge Lifecycle is the first cornerstones. It concerns the different knowledge processes that are interconnected: knowledge production, knowledge integration and a knowledge processing

environment. Together, the processes should result in the creation of new knowledge (i.e. knowledge production) that is transferred to the right employees in the organisation (i.e. knowledge integration). Finally, the employees should apply the newly received knowledge in their activities in order to create added value for the organization. The idea of a knowledge lifecycle in itself is not completely new. Also other authors, such as (Wiig, 1993; Weggeman, 1997), describe the notion of a knowledge lifecycle consisting of more or less similar knowledge processes. What distinguishes the knowledge lifecycle model from McElroy is the role of knowledge evaluation in the lifecycle, which is lacking in other models. In his view, individual agents (employees) acquire new knowledge from learning and practice and define their new knowledge in knowledge claims. In order to acquire support for a knowledge claim, the claim is first discussed on a group level. Finally, the knowledge claim is discussed at an organizational level and after acceptance it is integrated in the existing knowledge base.

2.2 Complexity Theory

As stated in the introduction, the claim of NKM is to achieve corporate sustainability and sustainable innovation. According to McElroy, this can be achieved through self-organization and organizational learning. Self-organization and organizational learning enable an organization to adapt itself based on experiences in the execution of activities or based on internal and external changes. In NKM, the self-organizing and learning capabilities are introduced by applying the theory of Complex Adaptive Systems (CAS) (Holland, 1995). Consequently, every employee is considered a Complex Adaptive System, which has an intrinsic motivation to detect changes and adapt to them (self organization). However, not only individual agents may be interpreted as CAS, but also groups and the organization itself are regarded as CAS. So besides individual learning, there is such a thing as group learning and organizational learning. This way, not only individuals, but also groups and the organization itself tend to track and adapt to organizational changes and to achieve corporate sustainability and sustainable innovation.

2.3 Open Enterprise

McElroy rejects the idea that decision making and knowledge making are the privileges of upper management only, as is typically the case in bureaucratic organizations. Knowledge making should be decoupled from decision making and should be a privilege of all employees and therefore be promoted by management. Furthermore, the created knowledge should be transparently available to all employees as long as it does not violate privacy considerations. Finally, all employees should always try to detect and report flaws in current knowledge claims during the process of applying this knowledge in action. This results in a continuous learning process in which knowledge is revised and updated.

To further stimulate the innovative capabilities of employees, organizational policies should be aligned with current behaviour and practices of employees and not the other way around. In traditional, bureaucratic organizations, desired behaviour is typically enforced top-down using policies. However, this constrains the innovative capabilities of employees instead of stimulating the capabilities. Therefore, all employees are motivated and empowered to formulate any new knowledge process related rule or policy. Finally, McElroy states that all employees should adhere to the rules and policies. Employees that can not identify themselves with the rules and policies should be excluded from the organization.

The concept of the Open Enterprise is not completely new. From organization theory, it is already known that bureaucratic or mechanistic structures are no longer applicable to today's fast changing environment and have been replaced by more organic structures that foster learning and innovation (Daft, 2006). Furthermore, from the field of Human Resource Management it is already known that

empowerment, i.e. providing employees with more control and resources (Thomas & Velthouse, 1990), will result in more innovative behaviour of employees.

2.4 Epistemic Hierarchy

The last cornerstone is the epistemic hierarchy of knowledge management, in which the relative position of knowledge management with respect to knowledge processing and business processing is sketched. The main thought behind the epistemic hierarchy is the fact that knowledge management cannot directly influence business processes, but that it can only influence the knowledge processes of the knowledge lifecycle that in their turn have an impact on business processes. This hierarchy is addressed in order to indicate the non-linearity that exists between knowledge management investments and interventions on the one hand and business outcomes on the other hand.

Based on this idea, McElroy states that KM should be a separate business function and should not be integrated with for example IT, R&D or HR and not be rooted in the executive function. The KM function should have enforceable authority to allocate resources that enhance knowledge processes. The executive function should only have coordinating responsibilities to the KM business function This is in line with Davenport & Prusak (1998), Smith & McKeen (2003) and Awad & Ghaziri (2004), who also identify that many organisations create a separate KM business function. However, they also state that "knowledge management is part of everyone's job" (Davenport & Prusak, 1998). Therefore, it can not be made the sole responsibility of a KM business function.

Policies	**NKM Cornerstone**	**Description**
McElroy's policies		
Fallibility	Knowledge lifecycle	The extent to which knowledge is regarded as fallible
Fact / Value	Knowledge lifecycle	The extent to which knowledge is evaluated: not, on a basis of factuality or on a basis of factuality and value
Fair Comparison	Knowledge lifecycle	The fact whether new knowledge is evaluated before it is integrated
Transparency	Open Enterprise	The extent to which knowledge is transparent to all employees
Inclusiveness	Open Enterprise	The extent to which employees are included in learning & training programs
Looking for Trouble	Open Enterprise	The fact whether employees are stimulated to detect flaws in knowledge
Growth of Knowledge	Open Enterprise	The fact whether employees are allowed to change knowledge processes
Policy Synchronization	Open Enterprise	The way in which policies are formulated: resulting from behavior or resulting in behavior
Enforcement	Open Enterprise	The fact whether employees that do not abide to the knowledge processes and rules are excluded from the organization or not
Knowledge Management	Epistemic hierarchy	The extent to which the knowledge management function is controlled by the executive function

Table 1. Policies of the Sustainability code

2.5 NKM policies

The four cornerstones are the theoretical pillars of McElroy's NKM theory. He derived 10 policies from these four cornerstones, which he refers to as the Sustainability Code (McElroy, 2005). A policy is a practical guideline that an organization should adhere to if it wants to adopt NKM. A complete

overview of the policies of the Sustainability Code is shown in table 1. For each policy a short description is provided and it is indicated from which cornerstone the policy is derived.

Holland's policies	
Embryology	The extent to which employees are allowed to have own personal learning agenda's
Politics	The fact whether knowledge creation is limited to the executive function
Ethodiversity	The fact whether employees are expected to have convergent or divergent worldviews
Connectedness	The extent to which resources for IT based and social connectivity is adequate

Table 2. Policies derived from Complexity Theory

Table 1 does not contain policies that are derived from CAS theory. That is because McElroy derived these four policies directly from the CAS theory from Holland (1995). An overview of the policies from CAS theory is shown in table 2. If an organization applies the policies of Sustainability Code and at the same time the policies derived from CAS theory, McElroy claims that an organization will achieve sustainable innovation.

3 RESEARCH MODEL

The goal of this research is to justify the claim that application of the 14 NKM policies will yield in corporate sustainability and sustainable innovation. In this section, we present the research model for justifying this claim. We start with presenting the individual constructs of our model: level of NKM application, performance indicators, and external orientation. Finally, we close the section by presenting our complete research model.

3.1 Level of NKM application

The cornerstones of NKM theory have been discussed in the previous section. Furthermore, it was shown that the major concepts behind these cornerstones can be expressed in fourteen policies as defined by McElroy (table 1 and 2). Some of these policies are more practical in nature than others. We have built an assessment method for measuring the level of NKM application that is based on these fourteen policies (Van Reijsen, 2006). In our assessment method, each policy is measured by one question. Hence, in total there are fourteen questions and together they measure the level of NKM application of an organization. The scales for each question are shown in Appendix A. The measurement of the level of NKM application is further elaborated in section 4.4.

We thoroughly validated the assessment method by using three different validation methods: an expert review, a non-expert pre-test, and a case study. An expert review has been conducted to test the construct validity of the assessment method (Yin, 1994). In the expert review, the method and the corresponding survey has been reviewed by an expert from a Dutch consultancy organization specialized in knowledge management. This review resulted in optimization of the assessment method in the form of rephrased questions and an altered chronology of the survey.

Secondly, face validity of the assessment method was tested by performing a non-expert pre-test. The method for conducting the face validity assessment is based on Walonick (2006). The pre-test consisted of ten individuals that were not knowledgeable about the content of the assessment survey, i.e. non-experts. The ten non-experts were asked to take the survey and think aloud while reading and answering the questions. By capturing all questions and remarks, revisions were made to the survey, i.e. rephrasing some questions.

Finally, a case study has been conducted at a Dutch based non-profit healthcare organization. Six respondents of this organization filled in the survey. Because all respondents work for the same organization, it was assumed that the respondents would provide similar answers. However, the results showed that the answers of the respondents were not consistent. An interview with the respondents as well as a document study was performed in order to provide more insight. These examinations resulted in an important insight. Respondents provided a desired situation rather than the actual situation in their answers. Analyzing the survey questions revealed that the questions encouraged respondents to indicate the desired situation. As a result, the survey has been extended with supporting texts such that respondents only provide answers that refer to the actual situation.

3.2 Performance Indicators

Performance indicators that measure the degree of corporate sustainability and sustainable innovation could not easily be derived from McElroy's theory, because it does not provide clear and complete definitions of the concepts of corporate sustainability and sustainable innovation. In order to capture the essence of corporate sustainability, a literature study has been conducted regarding the foundation of the sustainability concept. A good insight into the notion of sustainability is provided by Faber, Jorna & Van Engelen (2005), which has been used as the basis for our definition of corporate sustainability. Furthermore, NKM theory does not provide a consistent definition of sustainable innovation also. Therefore, only a performance indicator for the concept of innovation could be formulated. The assessment method is therefore only capable of assessing the extent to which the theory's application influences the corporate sustainability and innovative capability of an organization, while the sustainability aspect of innovation cannot be measured (presumably, if the theory's application does not add value to the innovative capability of an organization, it also does not add value to the sustainable innovative capability of that organization). Table 3 shows the results of the literature study and provides the performance indicators and the definitions that have been used to construct the indicators in this research.

Indicator	**Definition**
Corporate sustainability	The extent to which an organization is capable to track changes, internally as well as in the external environment, and is capable to adapt to these changes.
Innovation	The extent to which an organization is capable to introduce new ideas, products, services and practices, and is capable to apply them.

Table 3. The performance indicators of corporate sustainability and innovation

It can be argued that a gap exists between the concept of knowledge management on the one hand and the concepts of corporate sustainability and innovation on the other hand. However, the definition that was found for the concept of corporate sustainability closely aligns to NKM theory. This is best reflected from the indicators of its measurement. The "transparency" rule e.g. increases the potential of changes that can be tracked and the "looking for trouble" rule stimulates employees to track changes. In the case of innovation for example, the "fallibility" and "fact/value" rules stimulate evaluation of knowledge and yield shorter development cycles of new knowledge and hence new ideas and products.

3.3 External orientation

As indicated in section 3.2, the definition of corporate sustainability provided by the NKM theory (McElroy, 2003) itself is incomplete and ambiguous. Therefore, we developed our own definition of corporate sustainability, which is based on the work of Faber et al. (2005). This definition considers both internal and external orientation. However, almost all of the NKM policies are internally oriented. This leads to the assumption that application of the NKM policies is not the only condition to

obtain corporate sustainability. Furthermore, we assume also that external orientation increases the corporate sustainability of organizations.

Business Dimensions
1. Organization & Processes
2. Strategy & Policy
3. People & Culture
4. Monitoring & Control
5. Information Technology

Maturity Levels
1. Ad Hoc Orientation
2. Process Orientation
3. Organizational Orientation
4. Chain Orientation
5. Societal Orientation

Table 4. The business dimensions (Scheper, 2002) and the maturity levels (Boot, 1997) that build the framework for measuring the degree of external orientation.

To measure the degree of external orientation of an organization, we used a knowledge management framework that has been developed by Boot (1997). The framework has been developed to determine the position of a company with respect to good knowledge management practices, which is measured using a maturity scale. Here, a higher maturity is an indication for better knowledge management practices. The maturity scale from this framework (left side of table 4) has been used to define the degree of external orientation, because it provides a good description of how an organization can grow from no orientation to internal orientation to external orientation. The maturity levels are considered to be normative, implying that an organization that is externally oriented is also internally oriented. Furthermore, organizational theory learns that organizations consist of several dimensions that should be considered when describing or designing an organization (Daft, 2006). Therefore, we assume that an organization is only truly externally oriented if there is external orientation in all its dimensions. The business dimensions that are used are taken from Scheeper (2002) and are also shown in table 4 (right side). The use of this model for measuring the degree of external orientation is further elaborated in section 4.2.

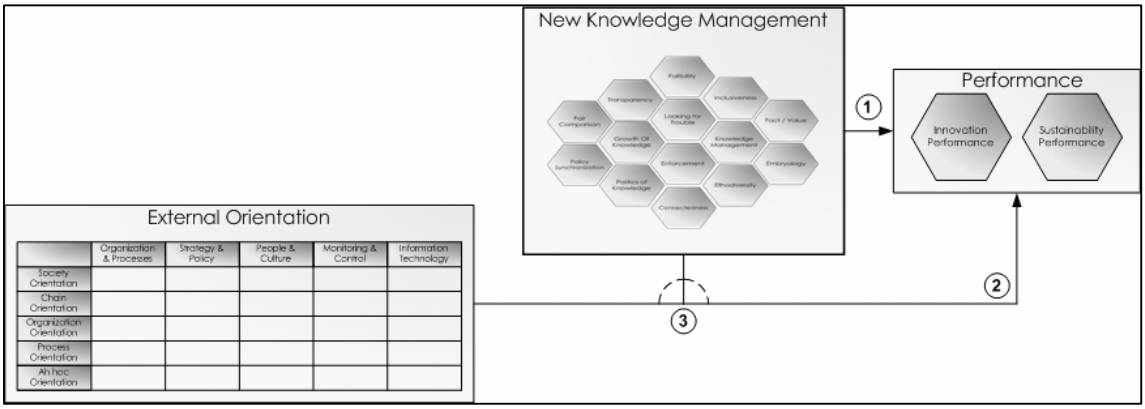

Figure 1. Outline of the research model.

3.4 Outline of the research model

The three constructs of our research model have been discussed in the previous sections. Figure 1 shows how the three key constructs of the assessment method are assumed to be inter-related in three different ways labeled as arrows 1, 2, and 3 (number is placed within circles). Arrow 1 represents the central claim in NKM theory, i.e. that NKM application is positively related to Performance. The second arrow represents our own assumption that External Orientation is also positively related with

Performance. Finally, the third arrow assumes that the combination of NKM application and External Orientation will have an additional positive relationship regarding to Performance. This last relationship implies that particularly organizations with high assessment scores on *both* variables will have the highest Performance scores.

4 RESULTS

4.1 Construction of the survey

Data for the empirical validation of the relations in our research model was collected using a survey. The respondents and organizations were selected using convenience random sampling (Triola, 2004). In total, 30 organizations were approached between June and August 2006. Using an on-line survey tool, each respondent was asked to provide answers to 14 questions that measure the application level of the fourteen policies. Each question consisted of 2 to 4 answer options (see Appendix A for the questions and answer options). The answers represented the degree to which an indicator is applied, expressed as a percentage. Answers from questions with 2 answer options were expressed as either 0% or 100%, 3 answer options are expressed as 0%, 50% and 100% etc. All answers were then averaged and treated as ratio level scale measurements (Stevens, 1946). In addition, 15 questions were posed to measure the organizations' External Orientation, based on the items as presented in section 3.3. Here, for each question, a 5-pointscale answer system is applied, were each answer represents a maturity level for external orientation. The answers were treated as interval level scale measurements. Finally, at the end of the survey, the Performance concept was measured by 2 questions, i.e. one question for the extent of performance of each of the two indicators presented in section 3.2. Here, both questions were answered on a 5-pointscale ranging from bad to excellent that was treated as an ordinal level scale measurement. In total, the survey consisted of 31 questions.

4.2 Measurement of the level of NKM application

The extent to which a particular policy is applied is measured using different scales, i.e. two, three or four answer options (see section 4.1 and Appendix A). Reliability analysis over these 14 indicators resulted in a Cronbach's alpha of 0.80. Although this indicates that a reliable scale can be constructed by aggregating all 14 indicators, inspection of the inter-correlations and principal components showed that one indicator has a weak contribution to one latent factor solution. This is the question regarding 'Fact/Value'. Excluding this question does not improve the Chronbach's Alpha significantly however. Hence, the complete set of indicators is used to measure the level of NKM application by computing the average scores over the 14 indicators.

4.3 Measurement of External Orientation

The degree of external orientation is measured by 15 questions with answer options ranging from 1 to 5 as maturity levels cumulating from 1 to 5. Each of the five business dimensions (strategy & policy, monitoring & control, organization & processes, people & culture and information technology; see section 3.3) is represented by three questions. Here, the measurement strategy is to aggregate all 15 answers (i.e. maturity levels) into one single maturity level. Reliability analysis resulted in a satisfactory Cronbach's alpha value of 0.80. Correlation analysis indicates that the 15 variables are all positively interrelated. In addition, principal component analysis supported a one-dimensional latent factor solution. Hence, the 15 variables were averaged into a single factor being the External Orientation concept.

4.4 Measurement of Performance

Both performance indicators , corporate sustainability and innovation, were formulated using a 5-point Likert scale. The scales vary from an organization is performing 'bad' (1), 'weak' (2), 'average' (3), 'good' (4) to 'excellent' (5). A bivariate correlation coefficient is computed to explore if both can be aggregated into one single (Performance) concept. It appears that corporate sustainability and innovation do not correlate significantly (r=.30, p=.11). Consequently, we keep both variables as separate indicators, i.e. two different dimensions of the Performance concept within our assessment method.

4.5 Validation of the three assumed relations in our research model

Our first validation test concerns the assumed positive correlations between level of NKM application on the one hand, and corporate sustainability and innovation as performance indicators on the other. As figure 2 depicts, this relationship is found for corporate sustainability, supported by a significant correlation coefficient (r=0.40; p=.03), but not for innovation (r=0.15; p=0.44). This result is supported by correlations computed with the fourteen different policies of the NKM concept. Five of the policies are significantly correlated with corporate sustainability, while none are significantly correlated with innovation. This confirms the claim that organizations with a higher level of NKM application also have higher scores on the corporate sustainability, but not on innovation.

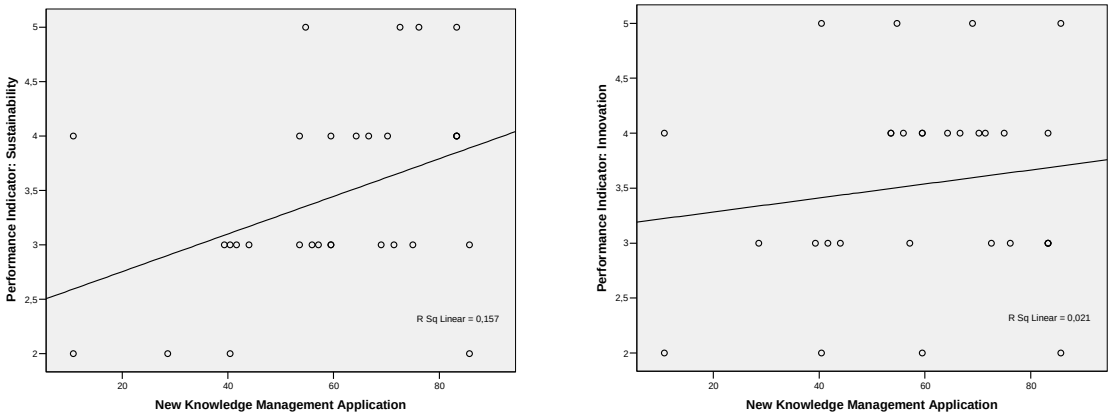

Figure 2. Scattergram of the relation between NKM application and the performance indicators of corporate sustainability (left side) and innovation (right side)

The second test concerns the relation between the extent of external orientation on the one hand, and the performance indicators corporate sustainability and innovation on the other hand. Depicted in Figure 3, the relation between external orientation and corporate sustainability is positively significant (r=.59; p=0.00), according to the expectation. The relation between external orientation and innovation, however, is not significant (r=0.29; p=0.12). Similar to the previous analysis, much more of the 14 policies are significantly correlated with corporate sustainability then with innovation. The claim can therefore be validated that a higher maturity of external orientation by organizations indeed yields a higher score on their corporate sustainability, but not the claim that external orientation coincides on innovation.

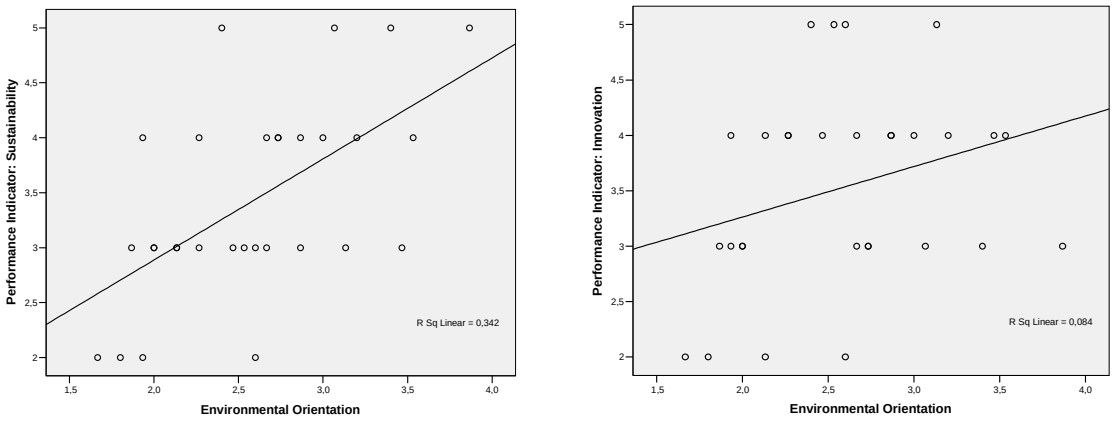

Figure 3. Scattergram of the relation between external orientation and the performance indicators of corporate sustainability (left side) and innovation (right side)

The third and final analysis concerns the expected interaction effect of the relationships in our research model. The interaction effect actually builds upon the main effects of NKM application and external orientation that were investigated above. It is hypothesized that in particular the *combination* (i.e. interaction) of external orientation and NKM application significantly improves an organizations' corporate sustainability and innovation. Figure 4 below illustrates the correlation analysis performed to validate this claim. With respect to corporate sustainability, the interaction effect is indeed significant. Corporate sustainability significantly increases with the combined increase of an organizations' NKM application and external orientation (r=.52; p=0.00). As for the relation with innovation, no significant interaction effect (i.e. correlation) was found (r=.22; p=0.24). Our third claim is therefore, again, partly supported.

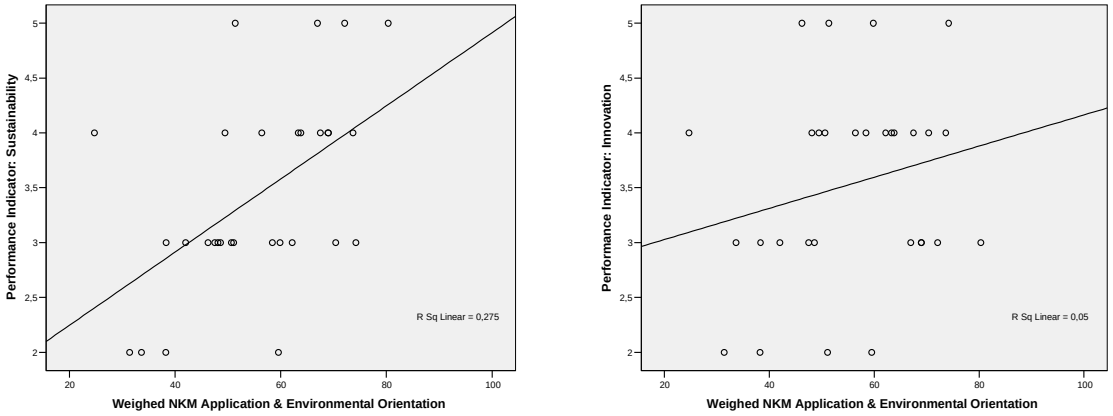

Figure 4. Scattergram of the interaction effect of external orientation on the relation between NKM application and the performance indicators of corporate sustainability (left side) and innovation (right side)

5 CONCLUSION AND DISCUSSION

In this paper, we wanted to discover to what extent the NKM claim of corporate sustainability and sustainable innovation is justified. This has been realized by creating an assessment method, containing constructs that enable the measurement of the relation between the level of NKM application and organizational performance with respect to corporate sustainability and innovation. In addition, a construct was developed to measure the degree of external orientation. The constructs and assumed interrelationships within the assessment method were validated using a survey among 30 organizations.

The research revealed that application of the policies as defined in the NKM theory indeed yields a higher performance for corporate sustainability. This relation does, however, not apply to the performance of innovation. As a result, one has to conclude that the claim is only partially justifiable. Moreover, it appeared that NKM application as well as external orientation influences the performance of corporate sustainability. Insights in the interaction effect of external orientation on the relation between application and the performance of sustainability provided the argument that application of the theory is not the only condition for an organization in order to perform sustainable. Moreover, the research results provide the argument that the theory is not a suitable theory for organizations that want to increase their level of innovation. Furthermore, it is apparent that neither external orientation nor the interaction effect of external orientation on NKM application yields an increase in the performance of innovation.

Future research could further validate the insights that were provided by this research. For example, an additional assessment of more organizations would provide more reliability for the findings of this research. Another interesting agenda item for a future research initiative may be to explore how the individual indicators from NKM application or from the external orientation framework add performance value to sustainability and innovation. Also, the relation between external orientation and the organizational characteristics from our original assessment method is an item that needs further research. Future research may provide answers to these questions. For now, the NKM theory should only be applied as a reference model for organizations that aim for corporate sustainability including an internal and external focus.

References

Alavi, M., Leidner, D.E., (2001). Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues. MIS Quarterly, 25(1), pp. 107-136.

Awad E.M., Ghaziri H.M. (2004). Knowledge Management. Upper Saddle River, New Jersey: Pearson Education.

Boot. (1997). Positiebepaling Kennismanagement. Soesterberg, The Netherlands: Triam Kennismanagement.

Daft , R.L. (2006). Organisation Theory and Design. 9th edition, South-Western Publishers.

Davenport, T., Prusak, L. (1998). Working Knowledge – How organizations manage what they now. Boston, Massachusetts: Harvard Business School Press.

Faber, N., Jorna, R., van Engelen, J. (2005). The sustainability of “sustainability”. A study into the conceptual foundations of the notion of “sustainability”. Journal of Environmental Assessment Policy and Management, 7(1), pp. 1–33.

Hansen, M.T., Nohria, N., Tierney, T. (1999). What’s your strategy for Knowledge Management. Harvard Business Review, March- April.

Liebowitz, J. (2001). Knowledge Management: Learning from Knowledge Engineering. CRC Press LLC, Boca Raton, Florida.

McElroy, M.W. (2003). The New Knowledge Management. Butterworth-Heinemann.

McElroy, M.W. (2005). The Sustainability Code - A Policy Model for Achieving Sustainable Innovation in Organizations. Retrieved July 3, 2006, from http://www.sustainableinnovation.org/The-Sustainability-Code.pdf.

Meyer, M., Zack, M. (1996). The design and implementation of information products. Sloan Management Review, 37(3), pp.43-59.

Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. Organization Science, 5, pp. 14-37.

Holland, J.H. (1995). Hidden order: How adaptation builds complexity. Perseus Books Group.

Reijsen, J. van. (2006). The New Knowledge Management? Scientific and practical validation of McElroy's New Knowledge Management (report no. INF/SCR-05-92). Utrecht University, Department of Information and Computing Sciences.

Scheper, W.J. (2002). Business IT Alignment: solution for the productivity paradox (In Dutch). Deloitte & Touche, Netherlands.

Smith, H. and J. McKeen (2003). Knowledge management in organizations: the state of current practice. In C. W. Holsapple (ed), Handbook on Knowledge Management. New York: Springer-Verlag.

Stevens, S.S. (1946). On the theory of scales of measurement. Scienc*e*, 103, 677-680.

Thomas, K.W., Velthouse, B.A. (1990). Cognitive Elements of Empowerment: An "Interpretive" Model of Intrinsic Task Motivation. The Academy of Management Review, 15(4), pp. 666-681.

Triola, M.F. (2004). Elementary Statistics. Pearson Education, Ninth Edition, Boston.

Walonick, D.S. (2006). The research process. Retrieved July 10, 2006, from http://www.statpac.com/research-papers/research-process.htm.

Weggeman M. (1997). Kennis Management – Inrichting en besturing van kennisintensieve organisaties (in Dutch). Scriptum Management.

Wiig, K. (1993). Knowledge management foundations. Arlington, Texas: Schema Press.

Yin, R.K. (1994). Case Study Research: Design and Methods. Sage Publications, Thousands Oaks, California.

Appendix A: New Knowledge Management indicator scales and descriptives

Policy Item	Answer Categories	Response (%)
Fallibility	Knowledge is regarded as always valid	20
	Knowledge is regarded as more or less valid	57
	Knowledge is regarded as always fallible	23
Transparency	Hierarchy strongly limits knowledge accessibility	0
	Hierarchy limits knowledge accessibility to some extent	40
	Hierarchy barely limits knowledge accessibility	60
Inclusiveness	Training and learning programs are provided top-down	13
	Training and learning programs are discussed	77
	Training and learning programs are freely accessible	10
Fair Comparison	New knowledge is not evaluated before it is accepted	53
	New knowledge is evaluated before it is accepted	47
Looking for Trouble	Employees are expected to apply knowledge	40
	Employees are expected to apply and evaluate knowledge	60
Growth of Knowledge	Employees are expected to perform knowledge processes	30
	Employees are empowered to alter knowledge processes	70
Fact / Value	Knowledge is not evaluated	20
	Knowledge is evaluated on a basis of factuality	7
	Knowledge is evaluated on a basis of factuality and added value	73
Knowledge Management	The KM function is action controlled	33
	The KM function is result controlled	23
	The KM function is semi-autonomous	37
	The KM function is autonomous	7
Policy Synchronization	Policy results in behavior	20
	Policy and behavior are aligned	63
	Behavior results in policy formulation	17
Enforcement	Employees that do not abide to knowledge rules remain active	33
	Employees that do not abide to knowledge rules leave	60
	Employees that do not abide to knowledge rules are excluded	7
Embryology	Employees are not allowed to have own, personal learning agendas	17
	Employees are provided time for own personal learning agendas	27
	Employees are provided time and resources for own personal learning agendas	57
Politics of Knowledge	Knowledge creation is dedicated to the executive function	13
	Knowledge creation is influenced by employees	27
	Knowledge creation is open to all employees	60
Ethodiversity	Employees are expected to have convergent worldviews	47
	Employees are expected to have divergent worldviews	53
Connectedness	The density of social and IT based connectivity is inadequate	23
	The density of social and IT based connectivity is adequate	77